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THE INFLUENCE OF CORPORATE GOVERNANCE ON INNOVATION DIMENSIONS – CASE STUDY OF EUROPEAN EMERGENT COUNTRIES

Abstract*. In the context of continuous transformation and development of the corporate sector in emergent and developed countries, the different approaches of corporate governance and innovation have attracted attention of researchers, legislators and practitioners. The main purpose of this paper is to identify the possible influence of corporate governance on the companies' innovation activities, considering four representative dimensions in the case of each analyzed concept. In this regard, the paper proposes two informational indicators: corporate governance index and innovation index, using a dataset provided by World Bank Database for 26 European emergent countries. Using the generalized linear model framework in order to test the relationship between these two indicators, the main result of this paper highlights that corporate governance have a significant impact on companies' innovation activities in case of selected countries.*

Keywords*: corporate governance, ownership, innovation, technologies and licenses, emergent countries.*

JEL Classification: G34, Q55, O16, O30

1. Introduction

Given the current context of growing global competition and the accelerating pace of changes on the market, innovation is the key determinant in the survival of companies. The awareness of the important role of corporate innovation activities leads to the increase of concerns regarding the main ways to enhance innovation activities in companies. Some studies have shown that companies that appeared to have relatively similar features achieved very different innovative performance (Belloc, 2010; Belloc, 2012). These findings led the research focus towards the possible ways of boosting the corporate innovative performance.

These concerns have been materialized by the appearance of comprehensive theoretical studies and empirical research focused on clearing up

the mechanism by which the corporate governance system may impact the corporate innovation activity (O'Sullivan, 2000; Bitar, 2003; Novikova, 2004; Becker-Blease, 2011; O'Connor and Rafferty, 2012).

Most of the literature about the relationship between corporate governance and corporate innovation activity refers to them in the context of developed countries, neglecting their linkage in case of emergent countries (Shapiro et al., 2015).

As revealed by Belloc, 2012 and Belloc at al., 2016, the literature that addresses the relationship between the corporate governance and innovation is characterized by a high level of heterogeneity. Thus, there is no unified view regarding the nature and the intensity of the corporate governance impact over the corporate innovation activity. This diversity of views regarding the link between the corporate governance and the corporate innovation activities unveils the complexity of this relationship.

The existence of very different points of views on the way the corporate governance may influence the innovation activity in companies is determined by the fact that the research studies have analyzed very different aspects of corporate governance and their impact on different measures of corporate innovation activity.

As revealed by Sapra et al. (2014), the corporate governance system has two components: external (national) corporate governance and internal corporate governance.

From the standpoint of the relationship with the corporate innovation activity, the internal action mechanism of the corporate governance comprises three distinct leverages: "the corporate ownership structure", "the corporate finance" and "the labour" (Belloc, 2010).

In turn each of these leverages of action may be considered from the viewpoint of different variables. Thus, the corporate governance influence on corporate innovation activity was approached by variables like the level of shareholder protection (Belloc, 2013), the ownership concentration (Minetti et al., 2012) or both the ownership concentration and the capital structure (Belloc at al., 2016).

Račić et al. (2008) showed that corporate governance has a major impact on innovation, both in terms of strategic and financial and also operational. Their research suggested that the corporate innovation activity may be affected by the shareholding structure, the internal organization of the company and by the authority relationship between different stakeholders.

Tseng et al. (2013) highlighted that the company's innovation capacity may be influenced by the corporate governance system. In their research, among other aspects of the complex relationship between the corporate governance and innovation, they studied the influence of number of females in the Board of Directors on the corporate innovation ability.

Regarding the corporate innovation activity, the approach is equally diverse. Some research studies are considering ex-ante aspects of innovation activity while others are taking into account ex-post measures of innovation. There are also research studies focusing on both approaches of innovation activities in companies (Sapra et al. , 2014).

On the other hand, much of the theoretical studies and also empirical research regarding the link between innovation and corporate governance have focused mainly on revealing the individual influence of a variable describing the corporate governance on a measure of the corporate innovation ability.

A multidimensional approach, grouping different dimensions of corporate governance and considering various dimensions of innovation activity, would be able to clarify more the complex relationship between the corporate governance and the corporate innovation.

2. Data and methodology

Basing on the existing literature about the corporate governance considered dimensions and on classification of World Bank database in case of innovation and technologies ones, our study suggests two composite indices, in case of 26 emergent countries from Europe (Appendix 1). From considered sample, 10 countries have a high income based economy, 11 countries are in the upper middle income group, while 5 countries have lower middle income.

The study is organised in two different stages, aiming to identify the possible influence of corporate governance dimensions on innovation activities dimensions. In first stage is used the methodology of principal components analysis (for details see Dima et al., 2013; Jolliffe, 2002) in order to construct two informational indicators – the first one in case of corporate governance dimensions and the other one in case of innovation dimensions - using a dataset available at World Bank databases (www.enterprisesurveys.org; www.data.worldbank.org). The sample includes 26 European emergent countries, for a 13-years period, between 2002 and 2014.

In order to capture the long-run trend for all variables were determined averages over period of time. Both of the proposed indices were determined based on relevant variables in case of each considered dimension. In this regard, the indicator relative to corporate governance is related to two of the corporate governance dimensions, each of them being expressed by a couple of variables: the corporate ownership structure dimension (the proportion of foreign ownership in the company and female participation in ownership) and the labour dimension (the companies which are offering formal trainings and permanent full-time employees). As well, the variables related to innovation dimensions of corporate

sector contains variables as proportion of companies with an internationally-recognized quality certification, proportion of companies having their own webpage, those which are using e-mail to interact with clients or suppliers and companies with an annual financial statement reviewed by external auditors (Table 1).

Table 1. Variables included in the estimated model of corporate governance influence on innovation activities

Corporate governance variables	Innovation variables
Proportion of private foreign ownership in a firm (%)	Percent of firms with an internationally-recognized quality certification
Percent of firms with female participation in ownership	Percent of firms having their own Web site
Percent of firms offering formal training	Percent of firms using e-mail to interact with clients/suppliers
Number of permanent full-time workers	Percent of firms with an annual financial statement reviewed by external auditors

Source: own elaboration after World Bank Database (http://www.enterprisesurveys.org)

Companies with an internationally-recognized quality certification are proving to have a constant concern for innovations aimed to improve the quality of processes developed in the company and improving the quality of products and services in order to meet the increasingly high expectations of customers.

Companies having their own webpage are focused on innovations for improving the company's image and enhancing its visibility. Among the most important advantages of owning a web page for a company are the chance to increase the sales volume by expanding the company's market in the online environment, expanding the company's market globally by using new sales tools, better connection with customers and their expectations, increasing the company strength on the market (Barone, 2011).

Companies using e-mail to interact with clients/suppliers show that are oriented towards innovations targeted to effective communication with their partners. Using e-mail for communicating with business partners enable better connection of the company with the market and its expectations, the possibility of extending the company's global market, beyond any geographical boundaries, with a low budget (Acevedo, 2016; Kooser, 2016).

Companies with an annual financial statement reviewed by external auditors prove that are supporting innovations that aim to increase the company's credibility in dealing with stakeholders, increasing the level of the information

transparency and, on this basis, enhancing the company's image in the relationship with business partners.

In aim of identifying the influence of corporate governance index on companies' innovation dimensions index, the second stage of the study uses the framework of generalized linear model (GLM), which represent a flexible proposal for ordinary least squares regression (for details see: Nelder and Wedderburn, 1972; Wedderburn, 1974). Taking into consideration the characteristics of our dataset, in implementation of GLM methodology is used the Gaussian distribution, as a recognized method in case of random variables with an unknown distribution. Moreover, was selected the Identity link function and assumed the relevance of Newton-Raphson method in order to check the obtained results robustness.

3. Findings

In Table 2 are revealed the results obtained by applying the methodology of principal components analysis in case of variables concerning to several corporate governance dimensions.

Table 2. Principal Components Analysis (PCA) for corporate governance variables

Eigenvalues: (Sum = 4, Average = 1)				
Component number	**Eigenvalue**	**Difference**	**Proportion**	**Cumulative proportion**
1	2.43	1.82	0.61	0.61
2	0.61	0.07	0.15	0.76
3	0.54	0.11	0.13	0.89
4	0.43	-	0.11	1.00
Eigenvectors (loadings):				
Variable				**Principal component 1**
Proportion of private foreign ownership in a firm (%)				0.51
Percent of firms with female participation in ownership				0.47
Percent of firms offering formal training				0.49
Number of permanent full-time workers				0.52

Notes: Included observations: 26; Computed using: Ordinary (un-centred) correlations; Extracting 4 of 4 possible components.
Source: Authors' computation

In this regard, the first part of this table shows information about the number of retained components, whereas the second part of the table summarises

information regarding eigenvectors. Thus, the obtained results reveal that the first component describes 61% from the total variance of the considered variables, while the second component accounts for 15% of this variance. Considering these results, it can be observed that the first two principal components of corporate governance variables accounts together for 76% from the total variance of the variables group. Moreover, these results may be considered appropriate in order to consider an informational synthetic index regarding the proposed variables. Likewise, the next part of the Table 2 shows the linear combination of the coefficients in case of the first principal component. In this regard, we can observe that there is an approximately equal linear combination of all proposed variables referring to corporate governance dimensions, all of them having close values, between 0.47 and 0.52, which enables us to consider it as a relevant index in order to describe the corporate governance level of analysed observations.

In Figure 1 there are illustrated the results offered by PCA framework in the case of corporate governance variables for analysed countries. Regarding this indicator, the lower values are observed in the case of eastern or south-eastern European emergent countries, non-EU members, and characterized occasionally by political instability or not consolidated financial systems. None of these countries belong to the group of the 10 high income emergent economies which were included in the sample, all of them being countries with lower middle or upper middle income. Thus, the values under -2 are encountered in Kosovo, Montenegro, Azerbaijan, Albania, while other negative values (between 0 and -1.9) of this proposed indicator describes countries like Turkey, Armenia, Georgia Kazakhstan, Macedonia and Ukraine. Moreover, the highest values of the indicator describe countries with a more stable economic system, many of them being members of international organizations such as EU and being constrained to certain economic and financial requirements presumed of belonging to these international structures. Thereby the highest values (over 1.3) describe countries like Slovak Republic, Belarus, Czech Republic and Hungary, while the next 5 positive values (between 1 and 1.3) define only EU countries such as Latvia, Estonia, Croatia, Romania and Poland.

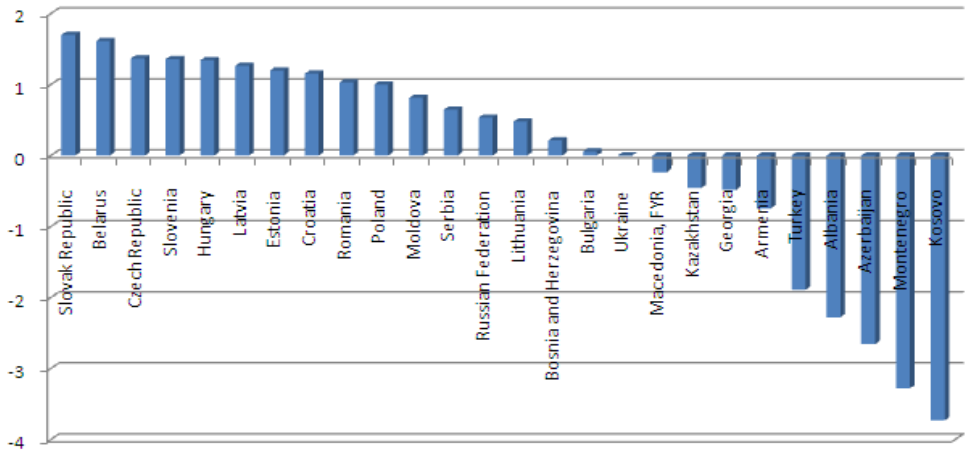

Figure 1. The values of corporate governance index

In this regard, we can appreciate that those countries with more mature economies and which belong to a specific international economic structure have a more developed corporate sector and are characterised by a higher value of the proposed corporate governance index.

In Table 3 are highlighted the results obtained by using the same principal components analysis framework for variables regarding innovation dimensions of the companies. Thus, the first principal component defines a considerable percent of the variables groups' variance (62%), while the second principal component explains 22% of this variance. In this frame, the cumulative percentage of first two components is 84% of the global variance, a considerable result that allows us to appreciate this enough significantly in order to construct an informational index related to companies' innovation activities. As well, the second section of Table 3 contains positive and fairy close values for the linear combination of coefficients, allowing the intention to consider this result enough representatives to build an informational index in case of companies' innovations activities.

The Figure 2 expresses the resulted index of companies' innovation dimensions separately for all 26 countries. As it can be observed, the result of this index suggests that can be identified four groups of countries. The first group contains five countries with values of the index over 2. Inside of this group can be remarked the highest value of the innovation index for the unique country with this value over 3, which is Hungary, a country which registered significantly economic performances in the last two decades and joined the European Community area in 2004. Along with Hungary in this first group with highest level of the index are other EU members with significantly economic performances, who acceded to the

union in the same year, such as Slovak Republic, Czech Republic, Slovenia and Estonia. It is important to be noticed that all of these five high values of innovation dimensions index describe countries from high income field.

Table 3. Principal Components Analysis in case of innovation activities dimensions variables

Eigenvalues: (Sum = 4, Average = 1)				
Component number	**Eigenvalue**	**Difference**	**Proportion**	**Cumulative proportion**
1	2.48	1.62	0.62	0.62
2	0.87	0.32	0.22	0.84
3	0.55	0.44	0.14	0.98
4	0.10	-	0.02	1.00
Eigenvectors (loadings):				
Variable				**PC 1**
Percent of firms with an internationally-recognized quality certification				0.48
Percent of firms having their own Web site				0.59
Percent of firms using e-mail to interact with clients/suppliers				0.58
Percent of firms with an annual financial statement reviewed by external auditors				0.29

Notes: Included observations: 26; Computed using: Ordinary (un-centred) correlations; Extracting 4 of 4 possible components.
Source: Authors' computation

In the second group can be found countries with positive values of innovation dimensions index (between 0.1 and 1), all of them being either EU members (Croatia, Poland, Lithuania, Latvia), either countries with declared intention to adhere at the union (Bosnia and Herzegovina, Serbia, Turkey).

The third group includes eight emergent countries with negative small values of this index, between -0.14 and -1.1, while the remaining ones are included in the fourth group (having the index values between -1.5 and -2.6).

The last category, with the lowest values of the index, is represented exclusively by non-EU members, all of them being emergent countries from Eastern or South-Eastern Europe, such as Albania, Montenegro, Georgia, Kazakhstan, Moldova and Azerbaijan.

Considering these results, we can appreciate that the highest values of innovation index describe in a significantly manner countries which adhered at a consolidated economical organisation – such as European Union – and which needed to undergo at several legislative and economical requirements. Moreover,

the highest values of this indicator are registered in cases of three countries from the Visegrad Group (Hungary, Slovak Republic, Czech Republic) which decided to have close relationships in the field of economic, military and energetic cooperation, all of them being included in group of countries with high income.

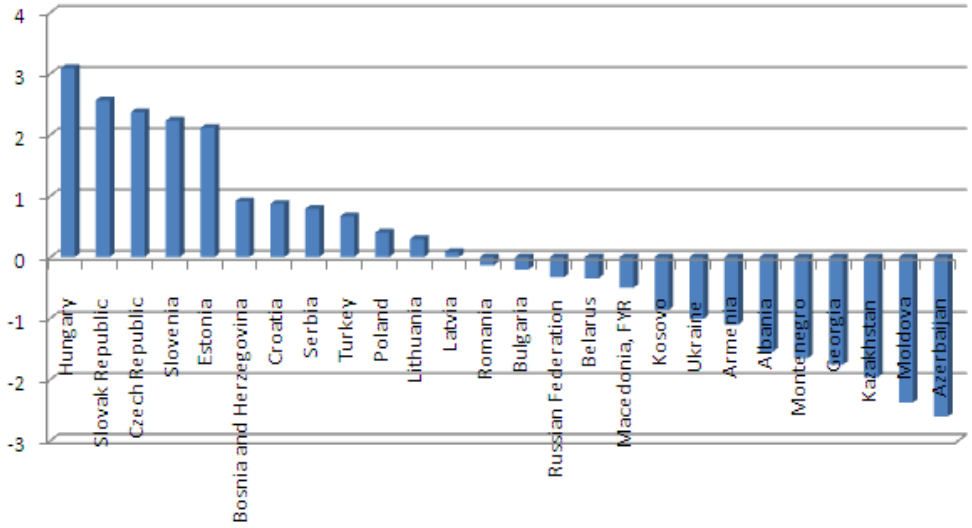

Figure 2. The values of innovation index

The second stage of the paper consists in analyzing the relationship between these two constructed indices by analyzing the impact of corporate governance index on innovation one. In this purpose, the proposed hypothesis is tested by using the methodology of generalized linear model (GLM) considering the innovation index as dependent variable and the corporate governance index as independent variable. Moreover, in the model were inserted two independent control variables: a variable related to experience of the top manager's which are working in corporate sector and another variable related to percent of companies which are identifying the access at finance as a major constraint. In the case of the first mentioned control variable we expected ex-ante a positive and significant influence on dependent variable, while in case of the second one we expected a negative influence on innovation index. The main reason of considering these two control variables is based, in the first instance, on the importance of managers' experience and their preferences to encourage innovation and secondly on the importance of financial resources in supporting innovative activities. Both these control variables were determined also as an average for the same period (2002-2014) as in the case of the other variables integrated in this study.

The results of applying GLM framework in case of proposed concepts are offered by Table 4. In this regard, the empirical results show that corporate governance index has a positive and significant influence on innovation dimensions index, having a statistical significance level of 1%. In addition, both control variables exercise a positive and consistent influence on innovation dimensions index, being as well statistical significant at 1%. Thus, considering the results obtained through the proposed methodology in case of estimated coefficients and t-statistics, we consider that the research hypothesis of the paper is confirmed, corporate governance framework being an important dependent variable for companies' innovation dimensions in case of developing countries.

Table 1. GLM estimation of corporate governance index impact on innovation activities dimensions index

Variables	Dependent variable: innovation activities dimensions index			
	Coefficients	**Std. errors**	**Z**	**P>|z|**
Corporate Governance Index	0.51***	0.10	4.96	0.00
Years of the top manager's experience working in the firm's sector	0.32***	0.05	5.93	0.00
Percent of firms identifying access to finance as a major constraint	-0.1***	0.03	-3.52	0.00
Constant term	-3.42	0.97	-3.53	0.00
Number of observations	26			
Pearson SSR	13.74			
Log likelihood	-28.60			
Modified Akaike Information Criterion	2.51			
Bayesian Information Criterion	-57.94			
Pearson statistic	0.62			

Notes: *** represent statistical significance at a level of 1%. Generalized Linear Model: a) Family: Gaussian, b) Link function: Identity, c) Optimization algorithm: Newton-Raphson

Source: Authors' computation

4. Conclusion

Given the complexity of the relationship between the corporate governance and the corporate innovation activity and the high degree of heterogeneity of theoretical and empirical studies on this subject, the present study aimed to extend the level of understanding of this relationship. This empirical research study

focuses on filling the need of explaining the relationship between the corporate governance and corporate innovation activity in emergent countries.

Thus, the present study tested the potential impact of corporate governance on companies' innovation dimensions within a group of 26 European emergent countries and obtained empirical results that confirmed for this sample of countries that the corporate innovation activity may be significantly influenced by the considered dimensions of corporate governance. Thereby, the adoption of adequate corporate governance practices is able to determine a positive impact on several innovation dimensions. These dimensions can be influenced as well by other issues such as managers' experience or financing possibilities.

Also, this study proposed a multidimensional approach that is much more appropriate in order to reveal the impact of corporate governance on corporate innovation, instead of testing the individual influence of a variable describing the corporate governance on a measure of the corporate innovation (Belloc, 2010).

The paper newness brought at the existing literature consists in analyzing the linkage between two of the corporate governance dimensions (the corporate ownership structure and labour) and four corporate innovation dimensions, less discussed so far, in a relatively homogenous group of countries, all of them being Europeans and emergent ones.

Thereby, the corporate ownership structure and labour are leverages through which the corporate governance may shape the company's propensity to innovations aimed to enhance the company's visibility and its image in the relationship with business partners and also to fulfill the customers' expectations.

In this regard, the main result of this study confirms the proposed hypothesis aiming that the corporate governance framework is able to influence significantly the considered dimensions of innovation activity, for selected sample of European emerging countries.

Based on this results, this empirical research study provide further evidence to support the theory on how the corporate government may shape the corporate innovation activity and expand the understanding of the relationship between them.

REFERENCES

[1] **Acevedo, L. (2016),** ***The Advantages of Email in Business Communication***; *Demand Media*, available online at http://smallbusiness.chron.com/advantages-email-business-communication-122.html, last accessed at 10.05.2016;
[2] **Barone, L. (2011),** ***5 Benefits of Having a Website for Your Small Business***; available online at http://smallbiztrends.com/2011/08/5-benefits-smb-website.html, last accessed at 8.05.2016;
[3] **Becker-Blease, J.R. (2011),** ***Governance and Innovation*****;** *Journal of Corporate Finance*, 17: 947–958, doi:10.1016/j.jcorpfin.2011.04.003;
[4] **Belloc, F., Laurenza, E., Rossi, M.A. (2016),** ***Corporate Governance Effects on Innovation when both Agency Costs and Asset Specificity Matter***; *Industrial and Corporate Change*, doi: 10.1093/icc/dtw009, Available at SSRN: http://ssrn.com/abstract=2721375;
[5] **Belloc, F. (2010),** ***Corporate Governance and Innovation: An Organizational Perspective***; *MPRA* Paper No. 21495, 2010, Available at https://mpra.ub.uni-muenchen.de/21495/, last accessed at 10.05.2016;
[6] **Belloc, F. (2012),** ***Corporate Governance and Innovation: A Survey***; *Journal of Economic Surveys*, Vol. 26, No. 5, 835–864, Blackwell Publishing Ltd, doi: 10.1111/j.1467-6419.2011.00681.x;
[7] **Belloc, F. (2013),** ***Law, Finance and Innovation: The Dark Side of Shareholder Protection***; *Cambridge Journal of Economics*, 37, 863–888, doi:10.1093/cje/bes068;
[8] **Bitar, J. (2003),** ***The Impacts of Corporate Governance on Innovation: Strategy in Turbulent Environments***; *Chaire management stratégique international Walter-J.-Somers, HEC Montréal, Cahier de recherche* N° 05-01, ISSN: 1711-6309;
[9] **Dima, B., Ionescu, A., Tudoreanu, P. (2013),** ***Corporate Governance and Financial Structures of Companies in Developing Countries***; *Annales Universitatis Apulensis Series Oeconomica*, 15 (1), 162-172;
[10] **Jolliffe, T. (2002),** ***Principal Component Analysis***; *Springer*, ISBN 0-387-95442-2;
[11] **Kooser, A.C. (2016),** ***Advantages and Benefits of Email for a Business*****;***Demand Media*, available at http://smallbusiness.chron.com/advantages-benefits-email-business-846.html, last accessed at 10.05.2016;
[12] **Minetti, R., Murro, P., Paiella, M. (2012),** ***Ownership Structure, Governance, and Innovation: Evidence from Italy***; *Government of the Italian Republic (Italy), Ministry of Economy and Finance, Department of the Treasury Working Paper No. 10.* Available at SSRN: http://ssrn.com/abstract=2186033;
[13] **Nelder, J., Wedderburn, R. (1972),** ***Generalized Linear Models***; *Journal of the Royal Statistical Society*, Vol. 135 (3), 370–384;

[14] **Novikova, J. (2004),** ***The Impact of Internal Corporate Governance System on Firms Innovative Activities***; *Division of Innovation, Lund Institute of Technology (LTH), Lund University, Sweden, Research design to be presented at the DRUID Academy's Winter Conference on Innovation, Growth and Industrial Dynamics Aalborg, Denmark;*
[15] **O'Connor, M., Rafferty, M. (2012),** ***Corporate Governance and Innovation***; *Journal of Financial and Quantitative Aqnalysis*, Vol. 47, No. 2, 397–413, doi:10.1017/S002210901200004X;
[16] **O'Sullivan, M. (2000),** ***The Innovative Enterprise and Corporate Governance***; *Cambridge Journal of Economics*, 24, 393-416;
[17] **Račić, D., Cvijanović, V., Aralica, Z. (2008),** ***The Effects of the Corporate Governance System on Innovation Activities in Croatia***; *Sociological Review*, Vol. 39, 101-114;
[18] **Sapra, H., Subramanian, A., Subramanian, K. (2014),** ***Corporate Governance and Innovation: Theory and Evidence***; *Journal of Financial and Quantitative Analysis (JFQA)*, Vol. 49, Issue 04, 957-1003, DOI: http://dx.doi.org/10.1017/S002210901400060X;
[19] **Shadab, H. B. (2008),** ***Innovation and Corporate Governance: The Impact of Sarbanes-Oxley***; *Journal of Business and Employment Law*, Vol. 10:4, 955-1008, available at: http://scholarship.law.upenn.edu/jbl/vol10/iss4/5;
[20] **Shapiro, D., Tang, Y., Wang, M., Zhang, W. (2015),** ***The Effects of Corporate Governance and Ownership on the Innovation Performance of Chinese SMEs***; *Journal of Chinese Economic and Business Studies*, Vol. 13, Issue 4, 311-335, DOI:10.1080/14765284.2015.1090267;
[21] **Tseng, C.Y., Wu, Z. J., Lin, C. Y. (2013),** ***Corporate Governance and Innovation Ability: Empirical Study of Taiwanese Electronics Manufactures***; *International Business Research*, Vol. 6, No. 7, ISSN 1913-9004, E-ISSN 1913-9012, 70-78;
[22] **Wedderburn, R.W.M. (1974),** ***Quasi-likelihood Functions, Generalized Linear Models and the Gauss—Newton Method***; *Biometrika*, Vol. 61 (3), 439–447;
[23] **World Bank Group**, *Enterprise Surveys Database*; last available at http://www.enterprisesurveys.org, accessed at 3.11.2015.

Appendix 1

Lower middle income countries	Upper middle income countries	High income countries
Armenia	Albania	Czech Republic
Georgia	Azerbaijan	Estonia
Kosovo	Bulgaria	Croatia
Moldova	Bosnia and Herzegovina	Hungary
Ukraine	Belarus	Lithuania
	Kazakhstan	Latvia
	Macedonia, FYR	Poland
	Montenegro	Russian Federation
	Romania	Slovak Republic
	Serbia	Slovenia
	Turkey	